REMARKS

Applicant appreciates the Office's review of the present application. In response to the Office Action, the cited references have been reviewed, and the rejections and objections made to the claims by the Examiner have been considered. The claims presently on file in the present application are believed to be patentably distinguishable over the cited references, and therefore allowance of these claims is earnestly solicited.

In order to render the claims more clear and definite, and to emphasize the patentable novelty thereof, claims 1, 7, 9-17, and 20-22 have been amended, claims 3, 18, and 28 have been cancelled without prejudice, and new claims 29-33 have been added. No new matter has been added. Accordingly, all claims presently on file in the subject application are in condition for immediate allowance, and such action is respectfully requested.

Rejections

Rejection Under 35USC Section 103

Claims 1-2, 4-6, 10-14, 16-17, 19-20, and 23 have been rejected under 35 USC Section 103(a), as being unpatentable over U.S. patent 5,929,875 to Su et al. ("Su") in view of U.S. patent 5,734,391 to Tanaka et al. ("Tanaka"). Applicants respectfully traverse the rejection and request reconsideration based on the amendment to claims 1, 10-14, 16-17, and 20, and features in the claims which are neither disclosed nor suggested in the cited references, taken either alone or in combination.

As to a rejection under 103(a), the U.S. Patent and Trademark Office ("USPTO") has the burden under section 103 to establish a *prima facie* case of obviousness by showing some objective teaching in the prior art or generally available knowledge of one of ordinary skill in the art that would lead that individual to the claimed invention. *See In re Fine, 837 F.2d 1071, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988)*. The Manual of Patent Examining Procedure (MPEP) section 2143 discusses the requirements of a *prima facie* case for obviousness. That section provides as follows:

> To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and reasonable expectation of success must be found in the prior art, and not based on applicant's disclosure.

Independent claim 1 (amended), and its dependent claims 2 and 4-6, are patentably distinguishable over the cited references because claim 1 emphasizes the novel features of the present invention which provide a sensor to detect pressure waves generated by an ink expulsion mechanism. In this regard, claim 1 recites a print head apparatus which includes:

"a substrate;
an ink expulsion mechanism provided on said substrate;
an ink well defined proximate said ink expulsion mechanism and a nozzle formed as an egress from said ink well in a member opposing said ink expulsion mechanism; and
a first pressure sensor that is formed on said substrate within said ink well and in a same plane as said ink expulsion mechanism, said first pressure sensor configured to detect pressure waves induced by a firing of said ink expulsion mechanism." (emphasis added)

The Su reference describes a sensor 92 having reed/beam type accelerometers 93 that is not formed within the ink well (cavity 99) as recited in Applicant's claim 1, but rather outside the ink well and within a resonance cavity 120 separated from the ink well 99 by substrate 110, barrier layer 114, and adhesive layer 116 (Fig. 4). In the Tanaka reference, pressure sensor 49 is disposed within the ink well (fluid chamber 17), but it is not formed on the substrate 13 on which ink expulsion mechanism (ejecting heater 19) is provided; rather, pressure sensor 49 is disposed on a different structure 14 entirely (Fig. 6). In addition, pressure sensor 49 is formed in a different plane from the ink expulsion mechanism (ejecting heater 19), rather than in the same plane as recited in Applicant's claim 1. Thus the applied references do not teach or suggest all of Applicant's claim limitations.

Furthermore, unlike Applicant's claimed invention, the egress nozzle 15 of the ink well 17 of the Tanaka reference is not formed in an ink well member opposing the ink expulsion mechanism as recited in Applicant's claim 1, but rather is formed in a member

laterally offset from, and orthogonal to, the ink expulsion mechanism 19. Such geometries are quite different. There is no reasonable expectation of success that two such dissimilar ink well geometries would function properly if combined.

Applicant respectfully traverses the Office's assertion that it would have been obvious to a person of ordinary skill in the art at the time the invention was made to include the claimed features of Applicant's invention. Such could be possible only in hindsight and in light of Applicant's teachings. Therefore, the rejection is improper at least for that reason and should be withdrawn.

Independent claim 10 (amended), and its dependent claims 11-14 and 16, are patentably distinguishable over the cited references because claim 10 emphasizes the novel features of the present invention which detect a particular characteristic of pressure waves generated by a clogged nozzle. In this regard, claim 10 recites a print head apparatus which includes:

"a substrate;
an ink expulsion mechanism formed on said substrate;
a cover plate spaced from said ink expulsion mechanism and having a nozzle formed therein, said nozzle being aligned with said ink expulsion mechanism; and
a sensor mechanism formed on said substrate that is capable of detecting a pressure wave of a first non-zero magnitude indicative of when said nozzle is clogged." (emphasis added)

The Su reference describes a sensor mechanism 92 for a print head which works differently. "In the detection or monitoring step 202, the sensors 65, 75, 85, 92 monitor the sound field radiated by nozzle firing (or by the application of firing signals) pressure waves" (col. 12, ln. 52-54). However, "when a plugged nozzle was fired, no signal was measured" (col. 15, ln. 30-31; emphasis added). Similarly, Table 1 indicates that "Clogged Nozzles" are detected by a test condition where "No Signal = Clog". However, as recited in Applicant's claim 10, a nozzle clog is indicated when a pressure wave of a first non-zero magnitude is detected. Furthermore, the Su reference teaches away by using the absence of a signal, rather than the presence of a signal, as the indicator of a clogged nozzle. It is further noted that the Office has not cited any specific portions of the Tanaka reference with regard to claim 10.

Therefore Applicant believes that the applied references do not teach or suggest all of Applicant's claim limitations.

Applicant respectfully traverses the Office's assertion that it would have been obvious to a person of ordinary skill in the art at the time the invention was made to include the claimed features of Applicant's invention. Such could be possible only in hindsight and in light of Applicant's teachings. Therefore, the rejection is improper at least for that reason and should be withdrawn.

Independent claim 17 (amended), and its dependent claims 19-20, are patentably distinguishable over the cited references because claim 17 emphasizes the novel features of the present invention which differentiate between ink expulsion conditions such as clogged nozzles, unclogged nozzles, and no-fire. In this regard, claim 17 recites a method of monitoring performance of a print head which includes:

"attempting expulsion of a volume of ink through a nozzle of a print head;
detecting a signal representative of a firing condition, the signal generated in response to the attempted expulsion; and
differentiating from the signal between a clogged nozzle firing condition, an unclogged nozzle firing condition, and a no-fire condition." (emphasis added)

The Su reference describes a method that determines firing conditions according to test conditions and parameters (Table 1). However, the "Nozzle Operation" section of Table I indicates that only two nozzle firing conditions are detected: clogged nozzles and damaged nozzles. When a no-fire condition occurs, no pressure wave is generated. However, since the Su reference considers the absence of a pressure wave (the "No Signal" condition) as an indicator of clogged nozzles as explained above with reference to claim 10, the Su reference cannot differentiate between a clogged nozzle firing condition and a no-fire condition, as is recited in Applicant's claim 17. It is further noted that the Office has not cited any specific portions of the Tanaka reference with regard to claim 10. Therefore Applicant believes that the applied references do not teach or suggest all of Applicant's claim limitations.

Applicant respectfully traverses the Office's assertion that it would have been obvious to a person of ordinary skill in the art at the time the invention was made to include the

claimed features of Applicant's invention. Such could be possible only in hindsight and in light of Applicant's teachings. Therefore, the rejection is improper at least for that reason and should be withdrawn.

Independent claim 23 is patentably distinguishable over the cited references because claim 23 emphasizes the novel features of the present invention which use an interdigitated pressure wave transducer having a directional detection characteristic to detect pressure waves. In this regard, claim 23 recites a printhead for an inkjet printing apparatus which includes:

> "a substrate;
> at least one ink ejector disposed on said substrate;
> an interdigitated pressure wave transducer disposed on said substrate and having a directional detection characteristic whereby a pressure wave traveling in a predetermined direction from said at least one ink ejector is preferentially detected." (emphasis added)

The Office admits that "Su et al. does not disclose having wherein said sensor includes one or more of the group of sensor including an interdigitated pressure wave transducer ..." (Office Action, p.3). The Office does not state that Tanaka teaches or suggests an interdigitated pressure wave transducer, nor does it state that either Su or Tanaka teaches or suggests a transducer having a directional detection characteristic whereby a pressure wave traveling in a predetermined direction from said at least one ink ejector is preferentially detected. Thus the applied references do not teach or suggest all of Applicant's claim limitations.

Applicant respectfully traverses the Office's assertion that it would have been obvious to a person of ordinary skill in the art at the time the invention was made to include the claimed features of Applicant's invention. Such could be possible only in hindsight and in light of Applicant's teachings. Therefore, the rejection is improper at least for that reason and should be withdrawn.

Formalities

Allowable Subject Matter

Claims 7, 9, 15, 21, 22, and 24 have been objected to as being dependent upon a rejected base claim and have been indicated as being allowable if rewritten in independent form to include all of the limitations of the base claim and any intervening claims.

With this Amendment, Applicant has rewritten allowable claims 7, 9, 15, 21, and 22 in independent form to include all of the limitations of the base claim and any intervening claims. Applicant, therefore, respectfully requests that the objection to claims 7, 9, 15, 21, and 22 be withdrawn and that these claims be deemed allowed.

Applicant notes that allowable claim 24 has not been rewritten in independent form at this time, because, as discussed above, Applicant believes that base claim 23 is in condition for allowance.

Comments on Statement of Reasons for Allowance

Applicant acknowledges, with appreciation, the allowance of claims 26-27.

Applicant agrees with the Office's conclusion regarding patentability, without necessarily agreeing with or acquiescing in the reasons set forth in the Office Action. In particular, Applicant wishes to emphasize that the patentability of claims stems from the respective combinations of elements defined by the claims, each viewed as a whole, rather than the presence of any particular element(s) in the combinations. Applicant submits that the indicated claims are allowable because the prior art fails to anticipate, teach, suggest, or render obvious the invention as claimed, independent of how the invention is paraphrased. Applicant thus relies on the claims, as drafted, rather than any characterization in the Office Action.

Omission of Disposition of Claims 8 and 25 in Office Action

Applicant notes that the Office Action did not state a disposition of claims 8 and 25, nor even acknowledge their status as pending.

In the event that claim 8 has been deemed rejected, Applicant requests reconsideration based on the allowability of base claim 1, as has been discussed above.

In the event that claim 25 has been deemed rejected, Applicant requests reconsideration based on the allowability of base claim 24, as has been indicated by the Office.

Applicant also notes that while certain other claims have been rejected, the Office Action provides no assertion as to where in the cited art their recited features (such as, for example, the acoustic wave piezoelectric transducer of claim 5, or the interdigitated pressure wave transducer of claim 6) may be found.

Therefore, Applicant respectfully requests that, if all presently pending claims are not found to be in condition for allowance, the next Office Action be issued as non-final.

Conclusion

Attorney for Applicant(s) has carefully reviewed each one of the cited references made of record and not relied upon, and believes that the claims presently on file in the subject application patentably distinguish thereover, either taken alone or in combination with one another.

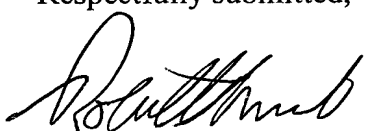
Therefore, all claims presently on file in the subject application are in condition for immediate allowance, and such action is respectfully requested. If it is felt for any reason that direct communication with Applicant's attorney would serve to advance prosecution of this case to finality, the Examiner is invited to call the undersigned Robert C. Sismilich, Esq. at the below-listed telephone number.

AUTHORIZATION TO PAY AND PETITION FOR THE ACCEPTANCE OF ANY NECESSARY FEES

If any charges or fees must be paid in connection with the foregoing communication (including but not limited to the payment of an extension fee or issue fees), or if any overpayment is to be refunded in connection with the above-identified application, any such charges or fees, or any such overpayment, may be respectively paid out of, or into, the Deposit Account No. 08-2025 of Hewlett-Packard Company. If any such payment also

requires Petition or Extension Request, please construe this authorization to pay as the necessary Petition or Request which is required to accompany the payment.

Respectfully submitted,



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